CLAIMS

What is claimed is:

[c01] A method for the generation and screening of three dimensional arrays comprising:

depositing a plurality of samples onto at least one substrate at discrete and defined positions in a three dimensional format such that each sample is isolated by the substrate from the other samples, and wherein each sample is defined by its (x, y, and z) coordinate to generate a three dimensional array of samples;

collecting analytical data from the sample array, wherein the analytical data is at least partially defined by its (x, y, and z) coordinate within the sample array;

correlating the analytical data collected from the array to the position of samples within the array; and

analyzing the analytical data for a parameter of interest.

[c02] The method of claim 1, wherein the array comprises multiple two dimensional arrays.

[c03] The method of claim 1, wherein the array comprises samples deposited on the surface of a three dimensional structure.

[c04] The method of claim 1, further comprising the use of masking and gradient deposition techniques to limit the deposit of samples to regions of interest.

[c05] The method of claim 3, further comprising evaporative methods for deposition of said samples.

[c06] The method of claim 5, wherein the evaporative methods comprise lasers, filaments, electron beams, or ion beams.

[c07] The method of claim 5, further comprising molecular beam epitaxy.

[c08] The method of claim 3, further comprising glow-discharge processes for deposition of said samples.

[c09] The method of claim 8, wherein the glow-discharge processes comprises sputtering.

[c10] The method of claim 3, further comprising chemical vapor deposition for deposition of said samples.

[c11] The method of claim 10, wherein the chemical vapor deposition process comprises photo-enhanced chemical vapor deposition or plasma-enhanced chemical vapor deposition.

[c12] The method of claim 3, further comprising pulsed-laser assisted deposition for deposition of said samples.

[c13] The method of claim 3, further comprising mechanical deposition of said samples.

[c14] The method of claim 13, wherein the mechanical deposition comprises spraying, spinning, dipping draining, flow coating, roller coating, pressure-curtain coating, or brushing.

[c15] The method of claim 3, wherein the samples have a thickness which ranges from 0.1 nm to 1 cm.

[c16] The method of claim 3, wherein the samples have a thickness which ranges from 1 nm to 1 mm.

[c17] The method of claim 3, wherein the samples have a thickness which ranges from 10 nm to 200 μm.

[c18] The method of claim 1, wherein the array comprises samples deposited within the interior of a three dimensional substrate.

[c19] The method of claim 18, wherein the samples are introduced into a pre-formed substrate.

[c20] The method of claim 18, wherein the samples are diffused into a pre-formed substrate.

[c21] The method of claim 18, wherein the substrate is tetrahedral.

[c22] The method of claim 18, wherein the substrate is polyhedral.

[c23] The method of claim 18, wherein the substrate is cylindrical.

[c24] The method of claim 18, wherein the substrate is spherical.

[c25] The method of claim 18, wherein the substrate is cubical.

[c26] The method of claim 18, wherein materials are diffused inwards from predetermined surface locations on the substrate.

[c27] The method of claim 26, wherein materials are diffused inwards from at least one surface plane of said substrate.

[c28] The method of claim 26, wherein materials are diffused inwards from at least one vertex of said substrate.

[c29] The method of claim 18, wherein at least some of the samples are introduced into a partially formed substrate and at least part of the substrate transformed to its final structure after deposition of the samples.

[c30] The method of claim 29, wherein the substrate comprises a gel which is polymerized upon application of radiation.

[c31] The method of claim 29, wherein the gel comprises acrylates or unsaturated polyester.

[c32] The method of claim 1, further comprising treating the deposited samples to initiate a chemical reaction within the three dimensional array.

[c33] The method of claim 32, wherein the treatment comprises the addition of a chemical agent.

[c34] The method of claim 33, wherein the treatment is applied differentially to at least some locations of the array.

[c35] The method of claim 33, wherein the treatment is applied in a constant manner to all locations of the array.

[c36] The method of claim 32, wherein the treatment comprises the application of electromagnetic radiation.

[c37] The method of claim 32, wherein the treatment comprises the application of ultrasound.

[c38] The method of claim 32, wherein the treatment comprises a change in temperature.

[c39] The method of claim 1, wherein the substrate is substantially inert.

[c40] The method of claim 1, wherein the substrate comprises a substance that interacts with at least some of the samples of the array.

[c41] The method of claim 1, wherein individual elements of the array are performance tested for stability upon exposure to at least one external agent.

[c42] The method of claim 41, wherein the external agent comprises a physical force.

[c43] The method of claim 41, wherein the external agent comprises electromagnetic radiation.

[c44] The method of claim 41, wherein the external agent comprises heat.

[c45] The method of claim 41, wherein the external agent comprises a chemical reagent.

[c46] The method of claim 41, wherein said external agent is applied in a constant manner to all samples of the array.

[c47] The method of claim 41, wherein the external agent is applied differentially to at least some of the individual samples in the array.

[c48] The method of claim 1, wherein spatially resolved measurement tools are used to collect and process data from said array.

[c49] The method of claim 48, further comprising applying a scanning probe over at least one of the samples.

[c50] The method of claim 49, wherein said scanning probe comprises confocal microscopy.

[c51] The method of claim 50, further comprising Raman confocal microscopy.

[c52] The method of claim 50, further comprising luminescence confocal microscopy.

[c53] The method of claim 49, wherein said scanning probe comprises two-photon microscopy.

[c54] The method of claim 49, wherein said scanning probe comprises multi-photon microscopy.

[c55] The method of claim 1, wherein collecting analytical data from the array is substantially simultaneous for each sample of the array.

[c56] The method of claim 1, wherein collecting analytical data from the array is performed separately for each sample of the array.

[c57] The method of claim 1, wherein the step of analyzing the collected data comprises univariate analysis.

[c58] The method of claim 1, wherein the step of analyzing the collected data comprises multivariate analysis.

[c59] A method for the generation and performance testing of three dimensional arrays comprising:

depositing a plurality of samples onto at least one substrate at discrete and defined positions in a three dimensional format such that each sample is isolated by said substrate from the other samples, and wherein each sample is defined by its (x, y, and z) coordinate to generate a three dimensional array of samples;

performance testing the array;

collecting data from the performance testing, wherein the data is at least partially defined by its (x, y, and z) coordinate within the sample array;

correlating the analytical data collected from the array to the position of samples within the array; and

analyzing the analytical data for a parameter of interest.

[c60] The method of claim 59, wherein the step of performance testing comprises applying at least one external agent to at least some of the samples of the array.

[c61] The method of claim 60, wherein the external agent comprises a physical force.

[c62] The method of claim 60, wherein the external agent comprises electromagnetic radiation.

[c63] The method of claim 60, wherein the external agent comprises heat.

[c64] The method of claim 60, wherein the external agent comprises a chemical reagent.

[c65] The method of claim 60, wherein said external agent is applied in a constant manner to all samples of the array.

[c66] The method of claim 60, wherein the external agent is applied differentially to at least some of the individual samples in the array.

[c67] A method for the analysis of three dimensional arrays comprising:

applying a scanning probe over a plurality of samples deposited onto at least one substrate at discrete and defined positions in a three dimensional format such that

each sample is isolated by said substrate from the other samples, and wherein each sample is defined by its (x, y, and z) coordinate;

collecting analytical data from the array, wherein the analytical data is at least partially defined by its (x, y, and z) coordinate within the sample array;

correlating the analytical data collected from the array to the position of samples within the array; and

analyzing the analytical data for a parameter of interest.

[c68] The method of claim 67, comprising luminescent confocal microscopy.

[c69] The method of claim 67, comprising Raman confocal microscopy.

[c70] The method of claim 67, comprising two photon microscopy.

[c71] The method of claim 67, comprising multi-photon microscopy.